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ROCKY MOUNTAIN SPOTTED FEVER.

A REPORT OF ITS INVESTIGATION AND OF WORK IN TICK ERADICATION FOR ITS CONTROL DURING 1913.

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Introduction.

At the close of the season of 1912, after eradicative measures had been suspended, Passed Asst. Surg. T. B. McClintic, who had been in charge of tick eradication and investigations of Rocky Mountain spotted fever in the Bitter Root Valley, Mont., for two years, himself became infected and died of the disease.

Dr. McClintic's laboratory investigations for the season of 1912 have not yet been published. Among them were included the determination of the percentage of infected ticks, and the discovery of immune (and therefore presumably previously infected) ground squirrels from several districts on the west side of the Bitter Root Valley.

During the winter of 1912 the Legislative Assembly of the State of Montana created a State board of entomology composed of the State entomologist, the secretary of the State board of health, and the State veterinarian, directed said board to take steps to eradicate and prevent the spread of Rocky Mountain spotted or tick fever, authorized the board to prescribe necessary treatment for domestic animals in infected territory, and appropriated for this purpose $5,000 for the year 1913.

The money set aside by the Public Health Service for the investigation of Rocky Mountain spotted fever and for cooperation with the State health authorities in tick eradication in the Bitter Root Valley ($10,000) unfortunately was not available until the end of June, and this was too late to begin a more extensive eradicative campaign than had been at first outlined.

Surg. L. D. Fricks, taking the place of Passed Asst. Surg. McClintic, was detailed to make investigations of Rocky Mountain spotted fever in Montana during 1913 and to cooperate with the Montana State board of health as to the measures necessary for its eradication from certain selected areas. He arrived in Missoula, Mont., March 30, and after conferences with the governor, the State health officer, and the State board of entomology, the Public Health Service was asked to take charge of the eradicative work in the southern half of the Bitter Root Valley. This territory is approximately 50 miles long by 10 miles wide. It lies on the west side of the valley, extends up into the Bitter Root Mountains, and includes the district over which the Public Health Service had conducted tick eradicative measures and laboratory investigations for the two years previous.

Tick Eradication.

It is now generally accepted that the wood tick *Dermacentor andersoni,* plays the important rôle in the transmission of Rocky Mountain spotted fever, and even those oldest inhabitants of the Bitter Root, who still cling to the sawdust and snow-water theories of infection, at the same time exhibit a wholesome respect for the Dermacentor. Measures for the suppression and prevention of Rocky Mountain spotted fever have been directed entirely toward the eradication of the ticks, and the only question involved has been to find a practical method of destroying them.

Heretofore the only measures for tick eradication systematically enforced in the infested territories have been:

(*a*) Dipping of domestic animals in arsenical dips.

(*b*) Killing of wild mammals over a limited area.

Individual property owners from time to time continue to place under cultivation their holdings of arable land on the west side of the valley at a cost of from $10 to $15 an acre and wherever this is done the ticks are practically eradicated; also, certain of the farmers who are convinced of the benefit to be derived from burning over the foothills as a means of killing the ticks start sporadic fires whenever they will burn, but no concerted action had been taken along this line until the present season, when arrangements were made with the Forest Service for a systematic burning early each season.

Dipping of Domestic Animals.

The Public Health Service, in cooperation with the State health authorities, has operated a dipping vat at Victor, Mont., since June, 1911, for the purpose of destroying adult ticks on domestic animals during the tick season. The working radius of this vat was fixed at 5 miles and all the domestic animals within this radius which were believed to harbor ticks have been driven in and dipped periodically at intervals of from two to three weeks. During the first two seasons there was no law compelling the owners to dip their stock, but with few exceptions they permitted it to be done.

During the winter of 1912–13, as above stated, the State legislature enacted a law empowering the State board of entomology to take steps to eradicate and prevent the spread of Rocky Mountain tick fever and made it a misdemeanor punishable by a fine of $100 to violate any of the rules or regulations of said board.

The State board ruled that all cows, except milking cows, horses, mules, asses, and dogs within the tick-control districts on the west side of the Bitter Root Valley, where dipping vats had been erected, should be periodically dipped under the direction of the officer in charge of the eradicative work.

This law was of great value in carrying on the work this season.

At the beginning of the tick season for 1913 a complete census of all live stock in the Victor district was taken and gave the following result: Horses and cattle in district, 1,856. Of these, approximately 400 animals (350 cattle and 50 horses) ranged over the tick-infested area and were regularly dipped for the destruction of adult ticks. The remaining 1,400 or 1,500 domestic animals were comprised under two heads: Those which did not range on tick-infested areas and were therefore free from ticks, and another very small proportion of dairy cows and work horses which were allowed to be cleaned of ticks by hand.

The number of domestic animals is given as "approximate" because there was a small fluctuation in the number of animals within the district during the tick season and a certain shifting of other animals from noninfested to infested territory,, or vice versa. For instance, following a succession of hot days in June practically all of the cattle were driven out of the wooded foothills by blood-sucking flies (*Tabanidæ*).

A census was also taken of the domestic animals in the Hamilton district. The number of animals in this district was slightly less than in the Victor district and not more than 300 were found in tick-infested territory.

No census was made of the Gold Creek district except for the animals ranging in the tick country. These were found to number approximately 250.

In the district south of Gold Creek around Darby so few cattle were found ranging into the foothills that the idea of constructing a dipping vat there was abandoned.

It is interesting to note that the foothills in this district have been generally cleared within the past few years and are now covered with young orchards. Also, that no cases of spotted fever have been recently reported from this district except those coming from well up the canyons.

Owing to the very late spring in the Bitter Root Valley, actual dipping of domestic animals did not begin at Victor until April 18. From April 19 to 26 it was too cold to put live stock through the dipping solution and there were other delays for the same reason during the first weeks of May, so that the domestic animals in the tick-infested territory were not all dipped until May 14. This included the following animals:

Horses	39
Cattle	328

Redipping, was begun on May 21 and completed June 19, as follows:

Horses	44
Cattle	305

At the request of the owners 180 sheep were dipped immediately following shearing in order to destroy the "sheep ticks" (*Melophagus ovinus*) which they harbored. No wood ticks (*Dermacentor andersoni*) were observed on the sheep at the time of dipping.

There can be no question of the necessity for dipping horses and cattle which are allowed to range over tick-infested territory in order to prevent the further propagation of ticks; but under unfavorable climatic conditions, such as prevailed at the beginning of this season, it is too much to hope that all ticks which attach themselves to domestic animals can be prevented from ovipositing by this means.

One warm sunshiny day in March is sufficient to bring forth the adult ticks and when this is followed by a week or more of freezing weather, as occurred this season, during which it is impossible to use the dip, some females may be fertilized and drop off for egg laying before it is possible to destroy them.

Evidence of this in the form of healing tickbites was found, both on horses and cattle, during April and while some of these bites may have been caused by *Dermacentor albipictus* there is no reason for trusting that all were so caused.

A continuous inspection of animals suspected of harboring ticks was maintained in the Victor district during June, July, and August, although the dipping was discontinued on June 19. No ticks were found on domestic animals after this date.

Dipping Solutions.

The dipping solution used at the beginning of the season was that given in Farmers' Bulletin No. 378, Department of Agriculture, the formula for which is as follows:

Sodium carbonate (sal soda)	pounds	24
Arsenic trioxide (white arsenic)	do	8
Pine tar	gallons	2
Water to make	do	500

With the arsenic purchased in the open market this solution gave on analysis 0.169 per cent of arsenious oxide (As_2O_3). It was found that this solution did not have sufficient strength to kill the engorged female ticks. Various changes in the strength of the solution were made up to 0.228 per cent, but the use of this dip was followed by serious complaints from the owners of the cattle. Hence, it would seem that a dip which can be used with impunity on the range cattle of Texas is entirely too strong for use in the Bitter Root Valley.

A chemical analysis was made by the State chemist of each solution before it was used, and after experimenting with different strengths it was concluded that a solution of 0.2 per cent arsenious oxide (As_2O_3) gave the best results in killing ticks without serious injury to the stock. This strength of arsenic, however, will not kill or prevent egg laying by all the engorged females.

The average time required by a cow in swimming through the Victor vat was found to be 15 seconds and the ticks submerged that length of time, whether unengorged or engorged, were killed or incapacitated by the solution.

Unfortunately, one of the favorite sites of attachment of the ticks on cattle is around the horns, ears, and high up on the neck. The cattle swim with their heads out of the solution, and it is almost impossible to completely submerge them for longer than 1 second. This period of exposure to the solution is not sufficiently long to do serious harm to the engorged females in any strength which can be borne by the live stock.

Construction of Dipping Vats.

In accordance with the agreement entered into with the State authorities, a dipping vat with corrals complete was constructed in the Hamilton district at a cost of $800, which was paid for out of the State funds. This vat was completed and placed in operation on July 8. A small number of animals were dipped, but in the absence of ticks, due to the lateness of the season, the dipping was discontinued.

An additional vat was constructed by the Public Health Service on Gold Creek, 9 miles south of the Hamilton vat, at a cost, including corrals, of $750. New corrals were also erected in connection with the Victor vat. As a result the service now has the southern half of the Bitter Root Valley, in which it has been requested to carry on eradicative tick measures, covered by three vats from 8 to 10 miles apart, all ready for operation as early next season as the weather conditions will permit. No more vats, under present conditions, can be used in this territory.

Destruction of Wild Animals.

In the 8 square miles immediately west of Victor, over which Passed Assist. Surg. T. B. McClintic destroyed several thousand small animals during the season of 1911 and 1912, there was a noticeable scarcity of ground squirrels (*Citellus columbianus*) as compared with other similarly situated sections on the west side of the valley. But it was also noticeable that the squirrels had begun to reoccupy their old haunts in certain localities.

No money was available for the destruction of wild animals until late in the season, when an active campaign was begun against the ground squirrels.

Objection has been made to a general eradicative campaign against the small rodents in the Bitter Root Valley because of the expense involved. This objection is without doubt well founded unless the land owners on the west side can be persuaded to cooperate in the work and thus reduce the cost.

In view of the fact that the ground squirrels are the most numerous rodents found in the valley, that they are serious agricultural pests, that they harbor a high percentage of immature ticks and, as shown by McClintic's experiments of 1912, that they presumably serve as relay stations for the perpetuation of the Rocky Mountain spotted-fever virus among ticks which, in default of some such susceptible host, would gradually become extinct, the advisability of formulating a practical plan for the destruction of these animals was carefully considered.

Late in the season 12 squirrel destroyers, or carbon bisulphide pumps, of the pattern used by the Public Health Service for killing ground squirrels on the Pacific Coast, were procurred and their use was demonstrated to the farmers on the west side of the valley.

Each land owner was informed that if he wished to rid his holdings of squirrels during the season of 1914 he would be furnished with a pump for a definite period and supplied with the necessary carbon bisulphide for its use.

This plan appeared to meet with general approval, and since the labor is the principal item of expense, it is expected that considerable good may be accomplished with a moderate expenditure by the service.

Experiments were also begun over a small area in order to determine the feasibility of destroying ground squirrels by the use of carbon bisulphide during the period of hibernation. Certain squirrel holes were marked while occupied by squirrels, properly charged with carbon bisulphide after the squirrels had hibernated, and will be closely watched for emerging squirrels next spring and the results noted.

Tick Surveys.

For the purpose of determining the relative extent of tick infestation in different sections of the Bitter Root Valley and to serve also as a check upon the efficacy of the eradicative measures which are to be enforced in the valley, tick surveys were begun, during the season, of several localities both on the east and west sides of the valley.

The method adopted for the collection of ticks was that used by the Bureau of Entomology. A strip of canton flannel two yards wide was dragged over a selected course at least one-half mile long, and the drag examined at frequent intervals for ticks. Courses were laid out which included, as far as possible, the various physical features and changes in vegetation to be found in the section under investigation. In this way the number of ticks per square mile was estimated in the different sections surveyed, and while neither exact nor complete, information derived from the surveys was of great practical value, illuminating, as it did, one of the obscure phases of the spotted fever problem in the Bitter Root Valley, namely, why the disease has never spread around the head of the valley to the east side; also, indicating the limitations of eradicative measures confined solely to the valley proper.

The following surveys were made:

1. Surveys on east side of valley; Sleeping Child and Willow Creek Canyons.
2. Surveys of foothills on west side; Victor district.
3. Cross sections of Bitter Root Mountains to points well above snow line, Victor district.
4. Surveys at heads of canyons, "goat country" on west side.

The surveys on the east side of the valley began at the foothills, approximately 10 miles east of the Bitter Root River opposite Hamilton, and extended back into the Rocky Mountains a distance of 15 to 20 miles. No marked difference was observed between the vegetation covering the mountains on the east side and that on the west, nor was there any appreciable difference in the number of small wild animals. There was this difference, however: Sheep had been closely grazed over this territory since about 1890 and other domestic animals practically excluded.

The surveys were made during the latter part of May and first part of June. Not one tick was found in the sheep country.

It is understood that ticks are fairly abundant on the east side of the valley north of these points where cattle instead of sheep have been allowed to range in recent years.

The surveys on the west side of the valley showed practically no ticks on the cultivated lands, extending up to the foothills; then a zone of heavy tick infestation along the hills where horses and cattle are allowed to range. Above the range of domestic animals a zone of moderate infestation estimated in one section as high as 7,040 ticks per square mile and above this certain areas, known as the "goat country" because of small roaming herds of Rocky Mountain goats, where the ticks were found in far greater numbers than in any other section surveyed, and estimated at millions per square mile.

From the findings enumerated above it would seem that no eradication campaign against spotted fever of the Bitter Root Valley can be complete which does not include some measure for the creation of a tick-free zone extending as far as possible up into the Bitter Root Mountains. Some method of protection must be provided, some buffer must be interposed, against the introduction by wild animals of ticks from above, a comparatively high percentage of which are known to be infective, before there can be any lasting security to the inhabitants in the valley below.

Sheep Grazing.

A study of tick conditions in the Bitter Root Valley and the methods of tick eradication which have been enforced heretofore led naturally to the question of whether there might not be some improvement or extension made in the campaign against the ticks which are responsible for the transmission of Rocky Mountain spotted fever to man.[1] With this end in view an investigation of sheep grazing in the valley was made and experiments were conducted with a flock of sheep in the tick-infested territory west of Victor, Mont., in order to determine the possible value of sheep grazing as a means of tick eradication in the valley. These experiments were made the subject of a previous report on their completion in June, 1913.[2]

Later the Bureau of Entomology of the Department of Agriculture began experiments along the same line in the Florence district. The findings as published by the Bureau of Entomology with unsheared sheep were quite as satisfactory as those previously observed and published by the Public Health Service. Upon six free-grazing sheep they reported 90 dead ticks and only two engorged females recovered, and of 69 ticks—23 males and 46 females—placed on two unsheared sheep, only one engorged female was recovered.[3]

The conclusions of the representative of the Bureau of Entomology, however, as to the probable value of sheep grazing in tick eradication were by no means favorable, but in view of the findings already reported, the high mortality among ticks attempting to attach themselves to unsheared sheep, and the lack of ticks in territory closely grazed by sheep in the Bitter Root Valley, together with the knowledge that the higher reaches of the Bitter Root Mountains are infested with ticks ever ready to serve as foci for reinfesting the west side of the valley even though it should be rendered tick free by the dipping of domestic animals alone; and above all in view of the possibility of placing the problem of tick eradication on an industrial basis so that the farmers may reimburse themselves for their own protection, there can be no question as to the desirability of continuing the sheep-grazing experiments along the lines proposed by the Public Health Service.

Because of the several factors which enter into the proposition of sheep grazing as a means of tick eradication no estimate can be made of the entire value to be derived therefrom until the experiment has been conducted on a large scale over a definite area for at least two seasons.

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[1] McCalla and Brerton, 1905; cited by Ricketts. King, Public Health Reports, July 27, 1906. Ricketts, Journ. Am. Med. Assn., 1906, vol. 47, p. 358.

[2] Public Health Reports, Aug. 8, 1913.

[3] Dept. Agriculture Bull. 14, Nov. 22, 1913

Investigation of the Geographical Distribution of Rocky Mountain Spotted Fever.

The most important phase of the Rocky Mountain spotted fever problem from a public-health standpoint is the question of the prevalence and geographic distribution of infective ticks in nature. Unfortunately, there is no way of determining the extent of this infection because of the enormous territory involved, its sparse settlement, and the fact that the common measure of tick infection is an accidental occurrence in the life history of the tick, that is, the attachment of an infective tick to a susceptible human being. Since the percentage of infective ticks determined experimentally in a heavily infected district, such as the west side of the Bitter Root Valley, is very small indeed, the probability of discovering all the areas of infection until they become fairly thickly settled is extremely remote.

By attaching ticks from the west side of the Bitter Root Valley in groups to guinea pigs Ricketts found one or more infective ticks in a group of 36 out of 296 ticks used in the experiment.[1] Maver found 2 ticks out of 402,[2] and McClintic, in 1912, 6 ticks out of 1,037 from the same region.

The obvious impossibility of using such a method for the determination of tick infection over the entire Rocky Mountain region emphasizes the importance of obtaining and carefully compiling the morbidity and mortality records of Rocky Mountain spotted fever from all the Western States.

According to the Bureau of Entomology the ticks which transmit Rocky Mountain spotted fever in nature (*Dermacentor andersoni* (Stiles) and *Dermacentor modestus* (Banks)) are distributed over approximately 600,000 square miles extending throughout the northern part of the Rocky Mountain region west to the Cascade Range and south to New Mexico.[3] No authentic case of Rocky Mountain spotted fever in human beings has been known to occur outside of this territory, but the disease has been transmitted experimentally to guinea pigs by eastern ticks after the ticks had been infected.

Certain clearly defined areas of infection in the Rocky Mountain region, such as the southern Bitter Root Mountains in Montana and the Snake River Valley in Idaho, have been known for years; but there are undoubtedly many more from which cases of spotted fever have not been reported and of which no record exists. No doubt there are infective ticks in other sections as yet unsuspected simply because one of these ticks has not happened to attach itself to a human being.

No understanding of the Rocky Mountain spotted fever situation can be had until the physicians of the Rocky Mountain region record and report their cases of this disease, including particularly the place of infection. From these data the areas of infection can in time be charted and the questions of extension, restriction, and eradication of infective ticks determined.

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[1] Trans. Chicago Path. Soc., 1907.

[2] Maria B. Maver, Journ. Infec. Dis., 1911, vol. 8, p. 322.

[3] Hunter and Bishopp. Dept. Agriculture, bull. 105.

Letters were written to the health officers of the different States in the Rocky Mountain region last season for information in regard to the prevalence of Rocky Mountain spotted fever in their respective States, and at the request of the health officers of Oregon and Washington an investigation was made of suspected cases in each of those States. The information obtained is given below briefly by States:

California.—

Year.	Cases.	Died.	Recovered.
1911	1	1	....
1912	1	....	1
1913	....	....	....

Both these cases were from Lassen County in the extreme northeastern part of the State. This area of infection has been known for several years.

Colorado.—There was no record of any case having occurred during 1912 or 1913. Once in a long while a case of Rocky Mountain spotted fever is heard of but none reported. Cases have been reported from Carbondale and Rifle in Garfield County.

Idaho.—The record of spotted fever in Idaho has been accurately kept since 1908 at least. The disease, of the mild type, is well known and generally recognized throughout the Snake River Valley. The State health officer charts each year the cases and deaths reported by counties. The record for the last four years is as follows:

Year.	Cases.	Deaths
1910	222	7
1911	334	9
1912	197	6
1913	239	4

The report for Soda Springs, Bannock County, the heaviest point of infection known, is interesting because of the lack of fatalities. It is as follows:

Bannock County, Idaho.

Year.	Cases.	Deaths.
1910	52	....
1911	90	....
1912	71	....
1913	40	....

Montana.—The following table shows the cases reported in Montana during the last three years:

Year.	Cases.	Deaths.
1911	17	6
1912	12	9
1913	8	7

There are three well-known areas of infection in Montana: The west side of the Bitter Root Valley in Ravalli and Missoula Counties, the Rock Creek district in Granite County, and the Bridger district in Carbon County, which extends south into Wyoming. One or two cases have been reported from other points in the State, but the records do not definitely establish any foci of infection other than those given. The fatality rate is high throughout the State of Montana, but the number of cases is decreasing, particularly in the Bridger district.

Dr. L. A. Gates, of Bridger, who reported four cases in 1903 and four in 1904,[1] has seen only three cases in the last three years. He accounts for the decrease in the following ways: (*a*) There is less stock of all kinds in the valley. (*b*) Much land has been cleared of brush and put in cultivation during the past few years. (*c*) Since the inhabitants have become acquainted with the cause of the disease they are very much more careful to avoid being bitten by ticks.

Nevada.—The State health officer reported for 1913 seven cases of spotted fever with one death. Four of these cases were in Humboldt County and three in Mineral County. The area of infection in Humboldt County has long been known and includes cases reported from Quinn River Valley, Paradise Valley, Winnemucca, and Fort McDermitt.[2] Upon further request, Dr. H. Duesing gave some very pertinent observations on spotted fever in the Paradise Valley, where he was health officer for three years, from which the following extracts are taken:

Year.	Cases.	Deaths.
1911	14	....
1912	6	....
1913	4	1

> Spotted fever appeared in the valley in 1880, and since then approximately 330 cases with 30 deaths have occurred. Indians are not immune, but only one Indian has died from the disease in the valley since 1880. One attack conveys absolute immunity and one-third of the native population in the valley have had spotted fever. He believes from observation that about 10 per cent of the ticks in this section are infective and that a tick must attach for at least two hours before it can transmit the disease. Spotted fever in the Paradise Valley never begins with a frank chill, nor is there any abrupt elevation of temperature. Except in fatal cases just before

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[1] Hygienic Laboratory Bull. 20, April, 1905.

[2] Kendall and Robinson. Cited by Rucker. Public Health Reports, Sept. 6, 1912.

death, the pulse and respiration are always slow. It is not unusual to find a patient with a temperature of 102.5 and a respiration of 18, even at an elevation of 6,000 feet. Spotted fever in the Paradise Valley resembles a combination of typhoid fever and measles. Cases are sometimes seen with not more than 15 spots and others with the body covered. The more spots the more grave the prognosis. Frequently the disease is as mild as measles among children.

The infection in Mineral County was discovered by Dr. F. C. Pache and, so far as known, the three cases seen by him are the first reported from this section of Nevada. The discovery was purely accidental. A cinnabar strike in the mountains 11 miles out of Mina was followed by a moderate rush into the district by prospectors in the latter part of June, July, and August. Twenty-five persons were exposed to tick bites by living in the woods and sleeping on the ground. Three cases of spotted fever developed; one severe, with rash covering the entire body, one moderately severe, and one mild. It seems probable that if this rush into the mountains had taken place earlier in the season more cases would have resulted.

In the Bitter Root Valley the tick season is practically over by the 1st of July and few cases of spotted fever develop after June.

Oregon.—Two cases of spotted fever were reported for 1913 from Malheur and Harney Counties. One of these cases was seen in La Grande, Oreg., with the State health officer, three months after recovery. The history of this case was as follows: W. M. W., age 55, itinerant minister. Slept in the brush near Drewsey, border of Harney and Malheur Counties, May 16. Next morning found 11 ticks attached to body. Two days later found 2 partially engorged ticks in arm pit, and the following day 1 fully engorged tick. Patient believed that the 14 ticks were acquired at the same time. On May 29 he was taken sick suddenly. This would give an incubation period of from 10 to 13 days, which is longer than usual. When seen, the patient's body was still covered with brownish blotches, averaging the size of a split pea. According to Maxey, Stewart, and Smith these may persist for years[1] and when present should aid in establishing the diagnosis of Rocky Mountain spotted fever, since they are extremely rare in other infectious diseases except typhus.

Two other cases reported as spotted fever from Cove, in Union County, were investigated with the State health officer. These cases were both in young children, who died within 48 hours after being taken suddenly ill. The history in both cases pointed to malignant scarlet fever.

Cases of spotted fever have been previously reported from southeastern Oregon, Klamath, Harney,[2] and Malheur[3] Counties.

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[1] Stewart and Smith. Med. Sentinel, Portland, Oreg., December, 1908.

[2] Steiner and Geary. Cited by Rucker, Public Health Reports, Sept. 6, 1912, p. 1466.

[3] Patterson. Idem.

This area of infection is continuous with that in Humboldt County, Nev., and is very sparsely settled. It is to be expected that with the completion of a railroad through this section of the State, which is now under way, more cases of spotted fever will be reported.

Utah.—The State law does not require the reporting of spotted fever cases and therefore no record is available. The State health officer is of the opinion that no cases have occurred recently. Cases have been reported from Utah and Wasatch Counties in the past.[1]

Washington.—Four cases of Rocky Mountain spotted fever occurred in Lincoln County during 1913. These cases were investigated at the request of the State health officer because of the uncertainty among the attending physicians as to the diagnosis. Two cases were reported by Dr. Richards, of Almira. These were seen and were undoubtedly spotted fever, both patients having probably contracted the disease while attending a picnic on Wilson Creek, a few miles southeast of Almira. One patient, reported by Dr. Fryer, of Riverside, contracted the disease in Lincoln County south of Wilbur, but died near Loomis; this patient was traveling overland by wagon and camped on the small streams each night.

Cases of Rocky Mountain spotted fever have previously been reported from Douglas[2] and Grant[2] Counties, just west of Lincoln, and Dr. Lee Ganson, of Odessa, reports that he has attended five cases near that place since 1909. Undoubtedly there is an area of infection in these counties which is strictly limited to the wooded streams and coulees. The reason for this is that there is no tick infestation except along the streams, all the arable land being covered by extensive wheat fields.

Wyoming.—Four cases of Rocky Mountain spotted fever were reported from Wyoming during 1913, one from Evanston, one from Caspar, and one from Thermopolis, all in the northwestern part of the State; all these cases ended fatally. This area of infection has long been known; it is continuous with and lies directly south of the infected district in Carbon County, Mont. The other case was reported from Superior, Sweetwater County, in the southwestern part of the State, and no history of the case could be obtained.

Besides the authentic cases reported above from the Rocky Mountain region, two cases have been reported from Ulster County, N. Y., one in 1912 and one in 1913. It was claimed that this infection was brought in by horses shipped from the Bitter Root Valley, but neither of the cases is positively known to have been spotted fever.

Two cases of spotted fever were also reported from Minnesota for 1913, but the histories given point to a septic infection following tick bite rather than to Rocky Mountain spotted fever.

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[1] Noyes and Wherritt. Cited by Rucker, Public Health Reports, Sept. 6, 1912, p. 1466.

[2] Smith. Cited by Rucker, Public Health Reports, Sept. 6, 1912, p. 1466.